

IN THE CLAIMS:

1-23. (Cancelled)

24. (Previously Amended) A method for supplying a contrast medium to a patient's vascular system comprising:

(a) providing a flexible bag filled with contrast medium at essentially atmospheric pressure;

(b) operatively connecting said flexible bag to the patient's vascular system via a gas transfer system, said gas transfer system including:

a dual check valve adapted to be connected to a lower pressure source of contrast medium, said dual check valve having a first inlet port, a first outlet port and a first inlet-outlet port,

said dual check valve containing a first one-way valve at said first inlet port automatically responsive to the relatively low pressure at said first inlet-outlet port to permit downstream fluid flow and to prevent upstream fluid flow,

said dual check valve containing a second one-way valve at said first outlet port automatically responsive to the relatively high pressure at said first inlet-outlet port to permit downstream fluid flow and to prevent upstream fluid flow,

said first inlet-outlet port in communication with said first and second one-way valves and adapted to be connected to a pump, and

a connecting tubular member having an upstream and a downstream end, said upstream end in communication with said first outlet port of said dual check valve;

(c) purging said gas transfer system of air; and

(d) delivering said contrast medium from said flexible bag through said gas transfer system to the patient's vascular system, the delivering step including:

suctioning at said first inlet-outlet port by the pump to cause said first one-way valve to automatically open, allowing flow of contrast medium from said bag into the pump, and to cause said second one-way valve to automatically close, preventing fluid flow upstream from said connecting tubular member into the pump, and

exerting positive pressure at said first inlet-outlet port from the pump to cause said second one-way valve to automatically open, allowing fluid flow from said pump into said tubular member, and to cause said first one-way valve to automatically close, preventing upstream fluid flow to the source.

25. (Cancelled)

26. (Previously Amended) The method of Claim 24, wherein said gas transfer system further comprises a first stopcock upstream of said first inlet port of said dual check valve to turn flow from the source on and off.

27. (Previously Added) The method of Claim 26, wherein said gas transfer system further comprises a second stopcock on said downstream end of said tubular member to turn flow into the catheter on and off.

28. (Previously Amended) The method of Claim 24, wherein said gas transfer system further comprises a stopcock on said downstream end of said tubular member to turn flow into the catheter on and off.

29. (Previously Amended) The method of Claim 24, wherein said gas transfer system further comprises an in-line check valve connected to said downstream end of said tubular member, wherein said in-line check valve has a second inlet port in which said tubular member is connected, a second inlet-outlet port adapted to be connected to an ancillary pump, and a second outlet port connected to a first stopcock which is connected to the catheter.

30. (Previously Added) The method of Claim 29, wherein said gas transfer system further comprises a second stopcock upstream of said first inlet port of said dual check valve to turn flow from the source on and off.

31. (Previously Added) The method of Claim 30, wherein said gas transfer system further comprises a third stopcock disposed between the ancillary pump and the second inlet-outlet port.

32. (Previously Added) The method of Claim 31, wherein step (c) comprises operating the pump to flush air out of said tubular member and subsequently operating said first stopcock to allow blood flow from the patient through the catheter and out of a port of said first stopcock.

33. (Previously Added) The method of Claim 32, further comprising a step of replacing blood in the catheter with said contrast medium prior to step (d).

34. (Previously Added) The method of Claim 33, wherein the step of replacing blood in the catheter comprises operating the pump to draw an aliquot of said contrast medium from said flexible bag and subsequently pushing said aliquot of said contrast medium into the catheter.

35. (Previously Amended) A method for supplying a contrast medium to a patient's vascular system, comprising:

(a) providing a flexible bag filled with contrast medium at essentially atmospheric pressure;

(b) operatively connecting said flexible bag to the patient's vascular system via a gas transfer system, said gas transfer system including:

a first dual check valve adapted to be connected to a lower pressure source of said contrast medium, said first dual check valve having a first inlet port, a first outlet port and a first inlet-outlet port,

said first dual check valve containing a first one-way valve at said first inlet port automatically responsive to the relatively low pressure at said first inlet-outlet port to permit downstream fluid flow and to prevent upstream fluid flow,

said first dual check valve containing a second one-way valve at said first outlet port automatically responsive to the relatively high pressure at said first inlet-outlet port to permit downstream fluid flow and to prevent upstream fluid flow,

said first inlet-outlet port in communication with said first and second one-way valves and adapted to be connected to a pump,

a connecting tubular member having an upstream and a downstream end, said upstream end in communication with said first outlet port of said first dual check valve, and

a third one-way valve in communication with said downstream end of said tubular member to permit downstream fluid flow from said tubular member and to prevent upstream fluid flow in said tubular member;

(c) purging said gas transfer system of air; and

(d) delivering said contrast medium from said flexible bag through said gas transfer system to the patient's vascular system, the delivering step including:

suctioning at said first inlet-outlet port by the pump to cause said first one-way valve to automatically open, allowing flow of contrast medium from said bag into the pump, and to cause said second one-way valve to automatically close, preventing fluid flow upstream from said connecting tubular member into the pump, and

exerting positive pressure at said first inlet-outlet port from the pump to cause said second and third one-way valves to automatically open, allowing fluid flow from said pump into said tubular member, and to cause said first one-way valve to automatically close, preventing upstream fluid flow to the source.

36. (Previously Added) The method of Claim 35, wherein said gas transfer system further comprises a first stopcock upstream of said first inlet port of said first dual check valve to turn flow from the source on and off.

37. (Previously Added) The method of Claim 36, wherein said gas transfer system further comprises a second stopcock downstream of said third one-way valve to turn flow into the catheter on and off.

38. (Previously Added) The method of Claim 35, wherein said gas transfer system further comprises:

a second dual check valve downstream of said downstream end of said tubular member and incorporating said third one-way valve,

said second dual check valve having a second inlet-outlet port adapted to be connected to an ancillary pump, and

said second dual check valve having a fourth one-way valve in communication with said second inlet-outlet port to permit downstream fluid flow from the ancillary pump, said third one-way valve preventing upstream fluid flow from the ancillary pump.

39. (Previously Added) The method of Claim 38, wherein said gas transfer system further comprises a first stopcock upstream of said first inlet port of said first dual check valve to turn flow from the source on and off.

40. (Previously Added) The method of Claim 39, wherein said gas transfer system further comprises a second stopcock downstream of said second dual check valve to turn flow into the catheter on and off.

41. (Previously Added) The method of Claim 40, wherein step (c) comprises operating the pump to flush air out of said tubular member and subsequently operating said second stopcock to allow blood flow from the patient through the catheter and out of a port of said second stopcock.

42. (Previously Added) The method of Claim 41, further comprising a step of replacing blood in the catheter with said contrast medium prior to step (d).

43. (Previously Added) The method of Claim 42, wherein the step of replacing blood in the catheter comprises operating the pump to draw an aliquot of said contrast medium from said flexible bag and subsequently pushing said aliquot of said contrast medium into the catheter.

44. (Previously Added) The method of Claim 24, wherein step (a) comprises:

- (1) filling said flexible bag with said contrast medium;
- (2) removing said contrast medium from said flexible bag;
- (3) repeating steps (1) and (2) multiple times; and
- (4) filling said flexible bag with said contrast medium at essentially atmospheric pressure.

45. (Previously Added) A method for supplying a contrast medium to a patient's vascular system, comprising:

connecting a source filled with a contrast medium to a patient's vascular system via a gas transfer system, the gas transfer system including:

a pump;

a dual check valve having an inlet port coupled to the source, an outlet port and an inlet-outlet port coupled to the pump;

a tubular member having an upstream end connected to the outlet port and a down stream end connectable to a catheter;

a first one-way valve coupled to the inlet port to control the flow of the contrast medium from the source; and

a second one-way valve coupled to the outlet port to control the flow of the contrast medium to the catheter for delivery to the patient's vascular system;

purging the gas transfer system of air, the purging step including:

drawing the contrast medium from the source to the pump, the drawing step:

automatically opening the first one-way valve, allowing the contrast medium from the source to flow into the pump; and

automatically closing the second one-way valve, preventing upstream fluid flow from the tubular member into the pump;

exerting positive pressure in the pump, the exerting step:

automatically opening the second one-way valve, allowing the contrast medium in the pump to flow into the tubular member; and

automatically closing the first one-way valve, preventing upstream fluid flow from the pump into the source.

46. (Previously Added) The method according to claim 45, further comprising:

coupling the catheter to the tubular member; and

repeating the steps of drawing and exerting to deliver the contrast medium from the source to the patient's vascular system.

47. (Previously Added) The method according to claim 45, further comprising coupling an in-line check valve having a third one-way valve to the downstream end of the tubular member, wherein during the drawing step, the third one-way valve automatically closes to prevent air from entering the tubular member and during the exerting step, the third one-way valve automatically opens to allow the contrast medium in the tubular member to escape into the air.

48. (Currently Amended) A method for supplying a contrast medium to a patient's vascular system, comprising:

connecting a source of a contrast medium to a patient's vascular system via a gas transfer system;

purging a gas transfer system of air, the gas transfer system including a check valve having an inlet port, an outlet port and an inlet-outlet port;

drawing the contrast medium from the inlet port coupled to the source into a pump coupled to the inlet-outlet port, the drawing step:

D automatically opening a first one-way valve coupled to the inlet port in automatic response to the drawing step, allowing the contrast medium from the source to flow into the pump; and

automatically closing a second one-way valve coupled to the outlet port in automatic response to the drawing step, preventing upstream fluid flow from a tubular member coupled to the outlet port; and

exerting positive pressure from the pump to:

automatically open the second one-way valve in automatic response to the exerting step, allowing the contrast medium in the pump to flow into the tubular member; and

automatically close the first one-way valve in automatic response to the exerting step, preventing upstream fluid flow from the pump into the source.
